

Despite certain attempts to obstruct noble scientific efforts, it is amazing how much human understanding of the Universe has advanced through the history. Today we know precise values of many physical constants and we have accepted distinct models of the reality as valid.

This is the list of the most important physical constants:

C or "speed of the light" = 299.792.458 m/s

G or "gravitational constant" = $6.674 \times 10^{-11} \text{ m}^3 \cdot \text{kg}^{-1} \cdot \text{s}^{-2}$

e or "charge of an electron" = 1.602177×10^{-19} Coulomb

h or "Planck`s constant" = $6.6260755 \times 10^{-34} \text{ J s}$

me or "mass of an electron" = $9.1093837015(28) \times 10^{-31} \text{ kg}$

mp or "mass of a proton" = $1.67262192369(51) \times 10^{-27} \text{ kg}$

mn or "mass of a neutron" = $1.67492749804(95) \times 10^{-27} \text{ kg}$

mtq or "mass of the top quark" = $3.0784(53) \times 10^{-25} \text{ kg}$

Ta0 or "absolute zero temperature" = -273.15 Celsius or 0 Kelvin

Λ or "cosmological constant" = $1.106 \times 10^{-52} \text{ m}^{-2}$

kB or "Boltzmann constant" = $1.380\,649 \times 10^{-23} \text{ J K}^{-1}$

NA or "Avogadro constant" = $6.022\,140\,76 \times 10^{23} \text{ mol}^{-1}$

$\Delta\nu_{\text{Cs}}$ or "Caesium hyperfine frequency" = $9\,192\,631\,770 \text{ Hz}$

When assembling this list of the fundamental physical constants, I immediately noticed the following: C is almost $300.000.000 \text{ m/s}$, almost equal masses of a proton and a neutron, enormous discrepancy between Ta0 (-273.15 Celsius or 0 Kelvin) and highest possible temperature in the Universe which is, until this day, 2×10^{12} Celsius (2 trillion Kelvins), achieved in the LHC quark-gluon plasma experiment, and significant difference between early values of the cosmological constant and latest made with the assistance of the Planck satellite in 2018.

Moreover, in 1967. the International System of Units (SI) redefined the second as the Cesium-133 atom duration lenght of releasing $9,192,631,770$ cycles of microwave radiation when making its "hyperfine energy transition". "National Institute of Standards and Technology" (NIST) developed the cesium fountain atomic clock NIST-F1, at the NIST laboratories in Colorado,

the USA primary time and frequency standard measuring device, much contributing to the international group of atomic clocks that define Coordinated Universal Time (UTC), the official world time, which uncertainty, as of January 2013,, has been reduced to about 3×10^{-16} meaning it would neither gain nor lose a second in more than 100 million years! It uses a fountain-like movement of the Cesium atoms, arranged and stimulated by six (6) laser beams in the special vacuum chamber cooling the substance near the absolute zero temperature, maximizing their fluorescence state or photon emission efficiency.

Source: NIST-F1 Cesium Fountain Atomic Clock | NIST

NASA Deep Space Atomic Clock is the most stable atomic clock ever made for space utilisation. Built by NASA's Jet Propulsion Laboratory, California, it uses Mercury ions with uncertainty factor of only one second every 10 million years. Deployed on the Earth this uncertainty lowers to just a second in about 400 million years which makes Mercury standard more precise than currently SI accepted Cesium due to the reliance on the optical, higher frequencies, rather than the microwave and measurement of just one atom of Mercury in contrast to the fountain of atoms in Cesium clock.

For commercial purposes we use Rubidium-87 which is much less accurate and cheaper.

Why is the speed of the light almost but not exactly rounded at 300 million?
Maybe because our vacuum is not exactly empty. There is still that zero-point energy even if we remove everything else, air preferably.

Dimensionless numbers:

α or "fine-structure or Sommerfeld constant" = 0.00729735 or 1 / 137.0360

Although mathematical, I must mention two constants which are certainly the same everywhere in the Universe:

Number Pi or π (the ratio of a circle's circumference and its diameter)
= 3.141592653589793...

Volume of a geometric body, for example a sphere =

$$\left(\frac{4}{3}\right) \cdot \pi \cdot r^3$$

The Universe is isotropic, homogeneous and flat. It is described by the Lambda Cold Dark Matter (Λ CDM) model.

Most relevant equations are:

$$E = m c^2 \text{ (Einstein)}$$

$$E = h \nu \text{ (Planck)}$$

$$m c^2 = h \nu \text{ (combined)}$$

Standard model of the particle physics is comprised of:

6 quarks: up, down, charm (or enchanted), strange, top, bottom & 6 anti-quarks

6 leptons: electron, muon, tau, electron neutrino, muon neutrino, tau neutrino & 6 anti-leptons

5 gauge or vector bosons: gluon, photon, Z^0 , W^+ , W^-

1 scalar boson: Higgs

With graviton and darkino, both scalar bosons, set would be perfectly encircled to the 32 pieces total.

Significant change in the cosmological constant value or atomic clock uncertainty improvements clearly show how our measurements and calculations advance with time or technological progress. One day we will be able to detect underlying energy fields, scan and tackle them. Just like today microbiologists recombine DNA, one day spacetime engineers will recombine or even rewrite the cosmic code, partially or entirely, enabling us to modify the Universe as we want. We will be able to travel back and forth in Time, create parallel realities and, yes, become immortal by blocking decay, reversing it or substituting spent components.